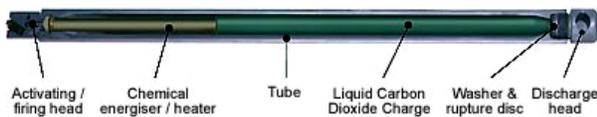


DISTRICT SAFETY NOTES

CARDOX IN MINING

Originally developed for safe use in gassy coal seams, the Cardox System is now widely used for both coal and other mining applications. In addition to pits and quarries, it is used to clear build-ups and blockages in bins, silos, pre-heaters, cyclones, cooler areas, rotary kilns, and other vessels.

In the Cardox System, a small electrical charge is applied to a chemical heater (a potassium chlorate mixture) which vaporizes liquid carbon dioxide that has been placed in a Cardox tube.



This conversion expands the carbon dioxide and builds up pressure inside the tube until it causes a rupture disc at the end of the tube to burst. This releases the carbon dioxide at a greatly increased volume through a special discharge nozzle to create a powerful heaving force.

Carbon dioxide gas is an inert gas that is commonly used in fire extinguishers, so it is safe to use without fear of generating secondary reaction with gases in the mine or vessel. In addition, the quick release of the gas refrigerates the discharge, bringing it to a temperature low enough to avoid ignition of any air-gas mixture inside the mine or blocked vessel.



Cardox shell (above) shown in a surface blast pattern.



Cardox sockets on a rotary kiln (above) at a cement plant.

SAFETY WITH CARDOX

This article does not address all regulations relative to explosives. Please see Subpart E of 30 CFR for a complete listing of MSHA metal and nonmetal regulations relative to explosives. Please call the nearest MSHA office for additional information.

Some of the chief safety concerns in a Cardox System used in metal and nonmetal mining applications are the storage, transportation, and handling of the chemical heaters.

Potassium chlorate is a crystalline salt that serves as an oxidizing agent in a Cardox System. It is defined as a low-grade explosive by both ATF and DOT regulations.

The chemical heaters containing potassium chlorate should be stored in a magazine. They cannot be stored in the same magazine with detonators.

Only persons trained and experienced in the handling and use of explosive material shall direct blasting operations and related activities.

The chemical heaters shall be transported without undue delay to the storage area or blast site. They shall be carried to and from the blast site in closed, non-conductive containers (not in a container with detonators).

Chemical heaters may be stored in a day box as long as it is locked or attended and emptied at the end of each shift (or attended) with the contents returned to a magazine.

All access routes to the blast site shall be guarded or barricaded. Ample warning shall be given to allow persons to evacuate. Clear exit routes shall be provided for persons firing the round. No work shall resume in the area until a post-blast examination has been conducted.